# MUSKWA WOLF MANAGEMENT PROJECT OF NORTHEASTERN BRITISH COLUMBIA 1985-86 ANNUAL REPORT

Ministry of Environment and Parks
Fort St. John, B.C.

Wildlife Working Report No. WR-21
July 1986

# MUSKWA WOLF MANAGEMENT PROJECT OF NORTHEASTERN BRITISH COLUMBIA

## 1985 - 86 ANNUAL REPORT

by

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## ABSTRACT

This report covers work completed for the Muskwa wolf management program for the 1985 - 86 biological year. Wolves have increased threefold since the termination of management. Ungulate juvenile survival was generally good oversummer and then declined thereafter as wolves immigrated to the Muskwa. High juvenile summer survival may have buffered adult ungulate winter losses to wolves. Further wolf increases are expected in 1986 due to reproductive output plus additional immigration.

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TABLE OF CONTENTS


| | Page |
|---|---|
| ABSTRACT | ii |
| LIST OF TABLES | iv |
| LIST OF FIGURES | iv |
| INTRODUCTION | 1 |
| METHODS | 3 |
| Wolf Surveys | 3 |
| Moose and Elk Surveys | 3 |
| Mountain Sheep Surveys | 3 |
| Caribou Surveys | 4 |
| Data Analysis | 4 |
| RESULTS | 4 |
| Wolf Survey | 4 |
| Moose Survey | 6 |
| Elk Survey | 6 |
| Mountain Sheep Survey | 6 |
| Caribou Survey | 6 |
| Weather | 7 |
| TABLES | 8-11 |
| DISCUSSION | 12 |
| CONCLUSIONS | 13 |
| LITERATURE CITED | 14 |

## LIST OF TABLES

Page

1 Wolf status in the Muskwa Program Area, March 1986 ..... .. 8

2. Moose proportions in the Muskwa, October 1985 ..... 9

3. Moose proportions in the Muskwa March 1986 ..... 9

4. Elk proportions in the Muskwa, October 1985 ..... 10

5. Elk proportions in the Muskwa, March 1986 ..... 10

6. Mountain sheep juvenile proportions in the Muskwa Area, February 1986 ..... 11

7. Caribou proportions in the Muskwa, October 1985 ..... 11

## LIST OF FIGURES

Page

1. Map of British Columbia showing the location of areas referred to in the text and the zonal NE administration boundary ..... 2

2. Muskwa wolf numbers, March 1986 ..... 5

# INTRODUCTION

The ungulate herds of northeastern British Columbia have undergone devastating declines. Of the three species that were most abundant in the early seventies, caribou have crashed by some 75% or 7500 animals (Bergerud 1978), moose by 80% or 90 000 animals (Elliott 1986a), and mountain sheep by 50% or 7000 animals (Elliott 1985a). These declines have been a direct consequence of the low survival of juveniles due to high predation, especially by wolves.

Wolves, in contrast, increased tremendously in the last ten to fifteen years (Bergerud 1978). Indeed, in 1984 in the Muskwa (Elliott 1984a), there was one wolf for every 26 $km^2$ (10 sq. mi.), probably the greatest large area wolf density in North America.

The Ministry of Environment commenced a program in 1984 to bring wolf and prey populations for the Muskwa portion of the Northeast (Figure 1) into balance (Elliott 1984a). This program aimed at maintaining wolf numbers at 1 per 260 - 390 $km^2$ (1 per 100 - 150 sq. mi.). Following dramatic positive response in ungulate juvenile survival, the program was halted in 1985.

The program area lies southwest of Fort Nelson, B. C., and is described in Elliott (1984a).

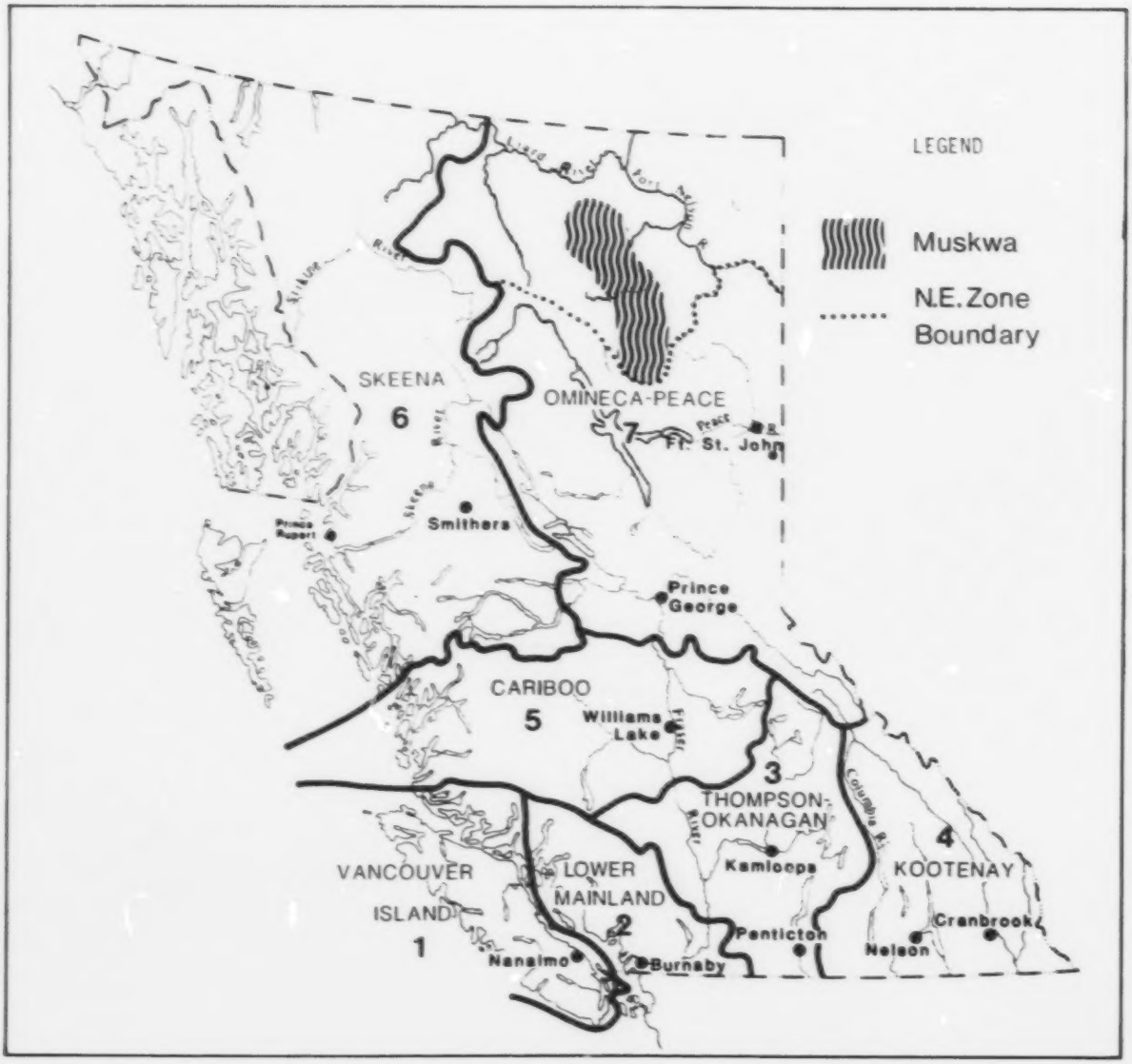


Figure 1. Map of British Columbia showing the location of areas referred to in the text and the zonal NE administration boundary.

# METHODS

## WOLF SURVEYS

Wolves were inventoried from a Bell 206 helicopter by flying likely wolf travel routes until fresh sign was spotted. The trail was then followed until either the wolves were seen or the tracks separated sufficiently to enable a count. When necessary, track counts were confirmed by landing and examining the sign in detail.

## MOOSE AND ELK SURVEYS

A similar methodology was used for elk and moose population composition surveys. In both cases, transects were flown for the purpose of determining the age and adult sex ratios. Transects were uniformly spaced straight lines (modified where necessary for feasibility in rough topography) and predetermined on 1:250 000 scale maps. This pattern was assumed to be random relative to the animals, and thus to produce unbiased estimates. Surveys were undertaken in late October, February, and March.

Winter moose were classified as to calf, non-calf male, or non-calf female, based upon shape, size, presence or absence of light vulval hair, head colouration, and antler scars. In autumn, moose were classified as to calf, yearling male, adult male, or non-calf, female based upon size, presence or absence of antlers, antler configuration, and vulval hair. Elk were classified as to calf, yearling male, 2+ male, or non-calf female on the basis of size, shape, and antler presence and configuration.

## MOUNTAIN SHEEP SURVEYS

Mountain sheep were inventoried in February-March from a Bell 206 helicopter. Complete units were searched by flying contours through all sheep habitat types and at all elevations and aspects. Speed and closeness were varied so that the observers were placed optimally according to visibility.

Animals were classified as to lamb, yearling, 2+-year female, 2-year male, and 3+-year male based upon size and horn characteristics. Because of the wider distribution of males, this survey method for smaller units may have been biased against males; ratios of juveniles to ewes, however, were believed to be unbiased.

## CARIBOU SURVEYS

Caribou were surveyed in October in the vicinity of the rutting benches between the Tuchodi and Tetsa Rivers. Animals were classified as to calf and adult based upon size and antler status. Adults were identified as to sex, based upon presence or absence of the vulva.

## DATA ANALYSIS

Sex and age composition data were expressed as ratios (number per 100 females) or as percentages of the total.

# RESULTS

## WOLF SURVEY

Figure 2 and Table 1 summarize the 1986 late winter wolf numbers for much of the Muskwa. The total area surveyed was approximately 14 000 $km^2$ (5400 sq. mi.). This area contained some 181 wolves in 44 packs (grouping of two or more wolves) and 5 singles for an average of 1 wolf per 77 $km^2$ (30 sq. mi.).

One year previously, following wolf population management, most of the Muskwa averaged 1 wolf per 234 $km^2$ (90 sq. mi.). Past work has shown that re-establishment of wolves within 12 months into small reduction areas results almost entirely from immigration from surrounding high wolf density areas (Elliott 1985b, c). Mean pack size (4.0), however, is less than in areas not managed for wolves, where sizes have been increasing the last few years from around 6 to now 9 wolves per pack (Elliott 1985c). The stage is set in the Muskwa for these small packs to increase size through reproduction. Pack density, nonetheless, is only half of that found for the Muskwa prior to reduction (Elliott 1984b). Presumably, therefore, there is also room for further increase through immigration.

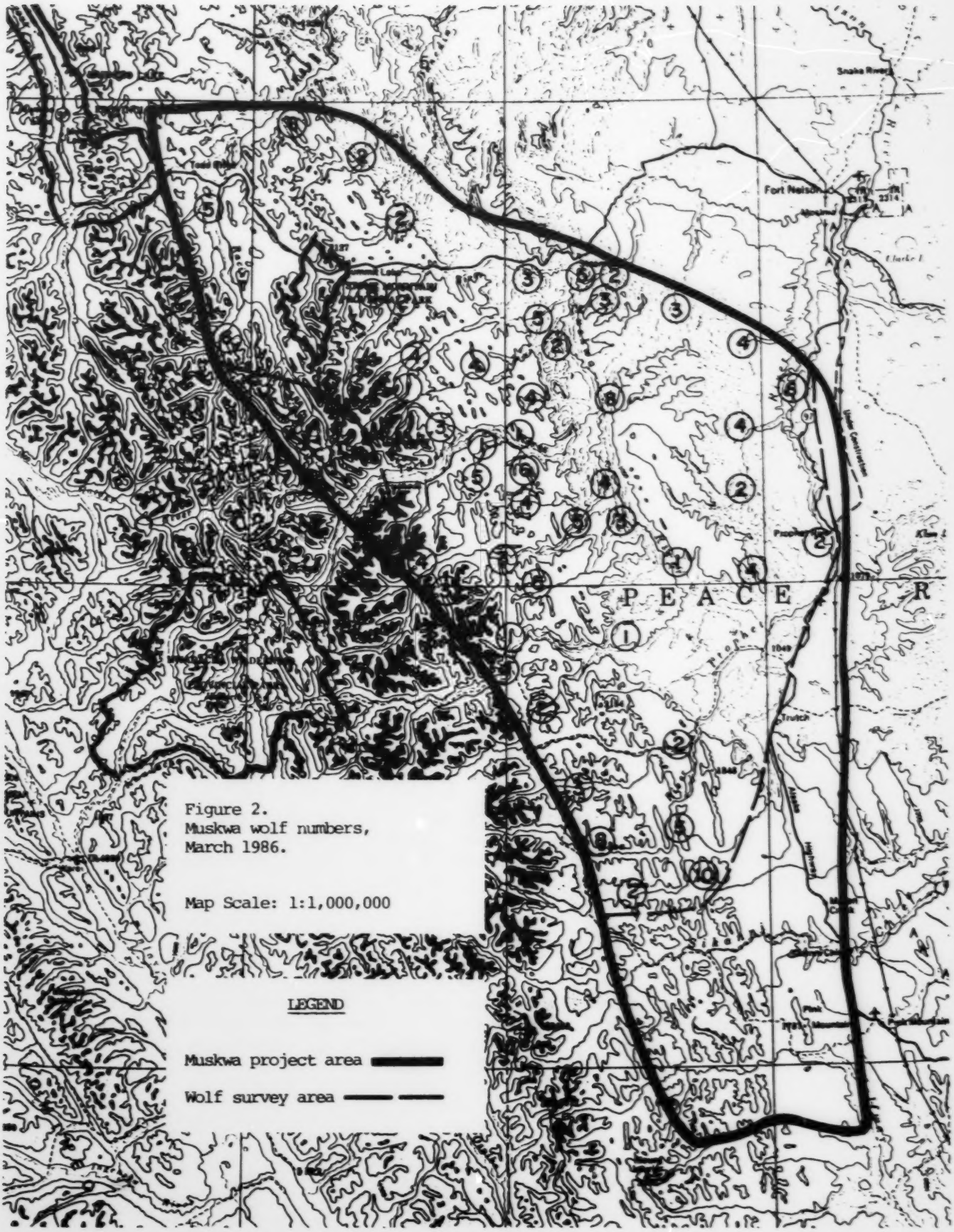


Figure 2.
Muskwa wolf numbers,
March 1986.

Map Scale: 1:1,000,000

LEGEND

Muskwa project area

Wolf survey area

## MOOSE SURVEY

The 1985 autumn moose survey (Table 2) sampled 1165 moose. At 26 yearlings per 100 cows, there appears to have been some spring/summer selective mortality for yearlings (36 calves per 100 cows the previous late winter; Elliott 1985b). Calf survival was good oversummer with 46 calves per 100 cows found in fall. This contrasts to 30 calves per 100 cows for the Muskwa in autumn, 1984 when spring wolf densities were 1 per 56 $km^2$ (21 sq. mi.). The Blue-Jennings unmanaged wolf area had 12 calves per 100 cows in autumn, 1985 (Elliott 1986b). The 1986 late winter survey (Table 3) sampled 266 moose. There were only 34 calves per 100 cows remaining at that time.

## ELK SURVEY

The 1985 autumn elk survey sampled 1158 elk (Table 4) and survival was very high. At 36 yearlings per 100 cows, there appears to have been very little spring/summer selective mortality (41 calves per 100 cows the previous late winter; Elliott 1985b). Calf survival was an impressive 71 calves per 100 cows to autumn. The previous autumn, when the spring wolf density for the Muskwa was 1 per 56 $km^2$ (21 sq. mi.), there were only 42 elk calves per 100 cows (Elliott 1985b).

The late winter elk survey sample involved 1474 elk (Table 5). Selective mortality for both calves and yearlings jumped sharply. Only 36 calves and 21 yearlings per 100 cows remained by late winter.

## MOUNTAIN SHEEP SURVEY

Mountain sheep proportions seen in the Muskwa are given in Table 6. Yearling survival (as estimated from yearlings per 100 ewes to lambs per 100 ewes the previous year; Elliott 1985b) was good at 48% with 17 yearlings per 100 ewes still alive in February from the good lamb survival of 1984-85 (36 lambs per 100 ewes). Lamb survival to February, with 31 lambs per 100 ewes, was intermediate between survival found for unmanaged and managed wolf areas (Elliott 1985c).

## CARIBOU SURVEY

Table 7 presents results of the fall caribou survey flight. This species, which represents only a small portion of the available large mammal component, shows high juvenile recruitment (52 calves per 100 cows, calves representing 26% of that total).

## WEATHER

Winter weather conditions in the Muskwa were mild. April 1 water equivalent snowpack for Fort Nelson (Water Management Branch, Province of B.C.) was only 85 mm or 83% of the average (1966-84).

Table 1. Wolf status in the Muskwa Program Area - March, 1986

| Parameter | Value |
|---|---|
| Survey area | 14 000 $km^2$ |
| Number of wolves | 181 |
| Number of wolf packs | 44 + 5 singles |
| Wolf density | 1/77 $km^2$ (1/30 $mi^2$) |
| Pack density | 1/318 $km^2$ (1/123 $mi^2$) |
| Wolves per pack | 4.0 |

Table 2. Moose proportions in the Muskwa, October 1985.

| Category | Number | Proportions | |
|---|---|---|---|
| | | No. Per 100 Cows (2+ Years) | % of Total |
| Adult cows (2+ years) | 548 | | 47 |
| Adult bulls (2+ years) | 226 | 41 | 19 |
| Yearlings [a] | 140 | 26 | 12 |
| Calves | 251 | 46 | 22 |
| | 1165 | | |

[a] Assumes a 50:50 sex ratio

Table 3. Moose proportions in the Muskwa, March 1986

| Category | Number | Proportions | |
|---|---|---|---|
| | | No. Per 100 Cows (2+ Years) | % of Total |
| Adult cows (2+ years) | 122 | | 46 |
| Adult bulls (2+ years) | 66 | 54 | 25 |
| Yearlings [a] | 36 | 29 | 14 |
| Calves | 42 | 34 | 16 |
| | 266 | | |

[a] Assumes yearling ratio by sex unchanged from autumn.

Table 4. Elk proportions in the Muskwa October 1985.

| Category | Number | Proportions | |
|---|---|---|---|
| | | No. Per 100 Cows (2+ Years) | % of Total |
| Adult cows (2+ years) | 523 | | 45 |
| Adult bulls (2+ years) | 72 | 14 | 6 |
| Yearlings [a] | 190 | 36 | 16 |
| Calves | 373 | 71 | 32 |
| | 1158 | | |

[a] Assumes a 50:50 yearling sex ratio

Table 5. Elk proportions in the Muskwa, March 1986

| Category | Number | Proportions | |
|---|---|---|---|
| | | No. Per 100 Cows (2+ Years) | % of Total |
| Adult cows (2+ years) | 890 | | 60 |
| Adult bulls (2+ years) | 74 | 8 | 5 |
| Yearlings [a] | 186 | 21 | 13 |
| Calves | 324 | 36 | 22 |
| | 1474 | | |

[a] Assumes a 50:50 yearling sex ratio

Table 6. Mountain sheep juvenile proportions in the Muskwa Area, February 1986.

| Category | Number | Number Per 100 Ewes (2+ Years) |
|---|---|---|
| Ewes (2+ years) | 241 | |
| Lambs | 74 | 31 |
| Yearlings | 41 | 17 |
| | 356 | |

Table 7. Caribou proportions in the Muskwa, October 1985

| Category | Number | Number Per 100 Cows | % of Total |
|---|---|---|---|
| Cows | 96 | | 50 |
| Bulls | 46 | 48 | 24 |
| Calves | 50 | 52 | 26 |
| | 192 | | |

## DISCUSSION

Wildlife response to the suspension of removal of wolves was generally in line with what would be expected (Elliott 1985b, c).

Wolves rebounded in numbers threefold within 12 months. This likely was primarily through immigration from surrounding high wolf density areas (Elliott 1985b, c). Further, this immigration likely occurred in the fall and early winter (Elliott and Webster 1982). During ongoing management of wolf numbers, their numbers were reduced through the winter such that higher wolf numbers were present for only a short period in early winter. With wolf management terminated, this did not occur. For the period between the autumn and late winter surveys (about 130 days), there were 23 530 wolf days (181 wolves * 130 days) of food consumption. Because of the high calf survival over summer (Tables 2, 4), calves were common, providing an abundance of easily killed prey. Carbyn (1983) found for an abundant multiprey system that the winter food consumption rate by wolves was 0.21 kg of prey per kg of wolf per day. Each wolf in the Muskwa weighs about 42 kg (92 lbs.) (Elliott et al., in prep.) and thus would consume 8.8 kg (19.4 lbs.) of food per day. For the 23 530 wolf days between surveys, the Muskwa wolves in the survey area would be expected to have consumed approximately 207 064 kg (456 482 lbs.) of meat.

Moose calf to cow ratios declined between the fall and late winter surveys from 46 to 34 calves per 100 adult cows. If most of the killing by wolves is directed towards calves, as expected from their vulnerability and abundance, then this ratio can be used to estimate the number of calves killed. The Core area (Elliott 1985b) encompassing 1375 $km^2$, contained 617 -1+ year cows in 1985. Assuming 95% of these were still present as 2+ year adult cows this last winter, the 14 000 $km^2$ wolf survey area would contain 5966 adult cows if this density is applied to the whole. It follows, therefore, that in the autumn there were 2744 calves that declined to 2028 by late winter or a 716 animal loss. At 150 kg (330 lbs.) liveweight (Franzmann et al. 1978) and 75% (Peterson 1977) or 112 kg (248 lbs.) edible weight, these calves would have provided 80 192 kg (176 793 lbs.) or 39% of the wolves expected requirement during the fall to late winter period.

A similar calculation is possible for elk. Elk calf to cow ratios declined from 71 to 36 calves per 100 adult cows between fall and late winter. The wolf survey area would contain about 500 elk in addition to the 4300 found in the Core area (Elliott 1985b) for a total of 4800 elk. Assuming 95% of the 1+ year cows from 1985 were still present this last winter, the 14 000 $km^2$ wolf survey area would contain 2925 adult cows. In fall, then, there were 2077 calves that declined to 1053 by late winter or a 1024 animal loss. For a calf liveweight of 125 kg (275 lbs.; Flook 1970) and 75% or 94 kg (206 lbs.) edible weight, these calves would have provided

96 256 kg (211 763 lbs.) or 46% of the wolves expected fall to late winter food requirement.

Moose and elk calf loss between fall and late winter can alone account for 85% of the expected wolf food requirement. Several hundred much lighter juvenile mountain sheep could cover a further 5% of the requirement and the remaining 10% could be accounted from yearling moose and elk kills. Thus, long and short yearling overwinter kill could provide the expected wolf food requirement without need of adult ungulate killing. During a winter study, Carbyn (1983) found, however, that scavengers capitalized on wolf kills by utilizing a further 34% for elk and 87% for moose of what the wolves took of the 75% portion of the carcass consumable by wolves. If these values apply to the Muskwa then the 181 wolves would have to kill about 550 800 kg (1 211 800 lbs.) of liveweight ungulates. A considerable number of adult ungulates would also have had to be killed by the wolves in such a case.

## CONCLUSIONS

The suspension of wolf removal in the Muskwa has quickly resulted in a shift in the wolf-prey balance. In consequence, prey juvenile recruitments are substantially below those expected for a wolf-managed system. However, low wolf numbers over summer and consequent high summer juvenile ungulate survival probably did substantially ameliorate the losses to wolves, of adult ungulates, in particular. Thus, while gains are far below what could have been achieved with continued wolf management, ungulate populations likely still increased slightly during this period (1985-86). If wolf management were to restart this winter (1986-87) thereby reducing winter losses, a small ungulate increase could probably be attained this coming year.

Pulse management of wolves is an inefficient system. Over the long term more wolves have to be killed (because of internal production), which also increases cost. Positive prey population response is substantially reduced so the gain per effort is much lower.

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